

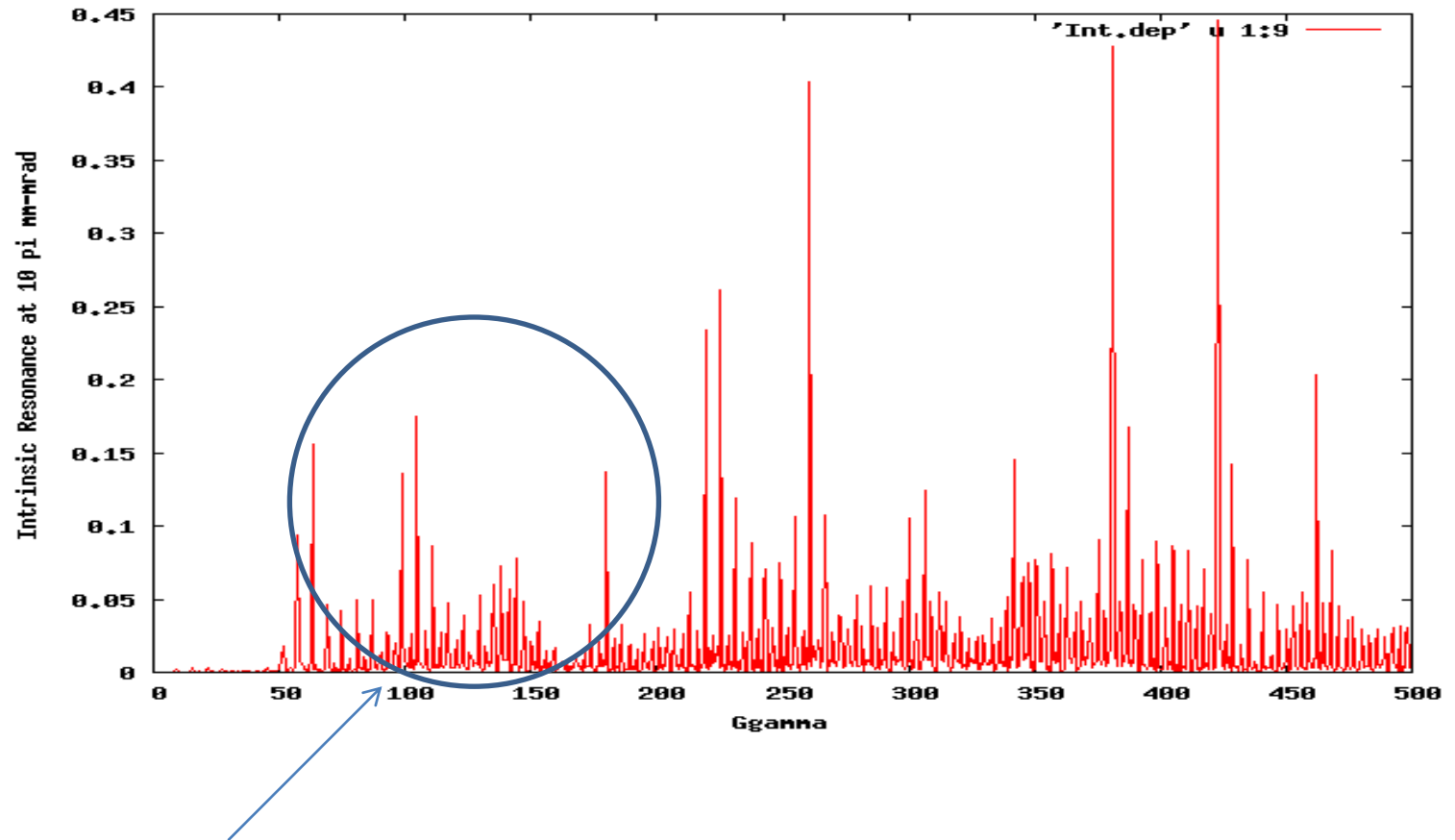
Polarization for pp-Au

V. Ranjbar, Mei Bai, Zhe Duan

Overview

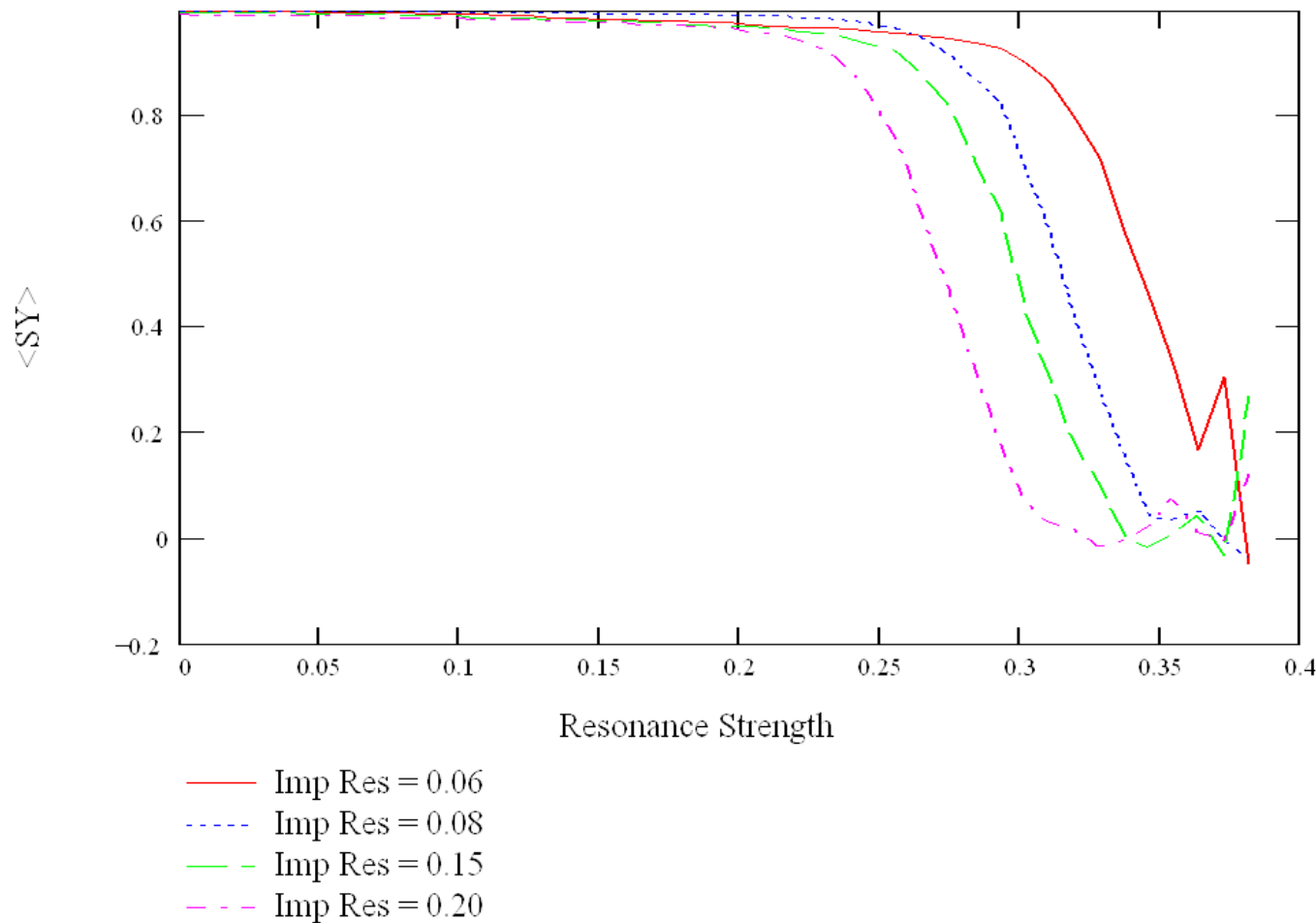
- Ramp Optics: Same as we have been using so we anticipate same transmission efficiency.
- Collision Polarization lifetime issues: This is the real question. Mei and Zhe Duan have spent a lot of effort to understand mechanism driving current lifetime of Polarization at store. Many questions remain but a few things we can understand:
 - Polarization decay is caused by beam-beam collisions
 - Under beam-beam collisions there are both direct spin effects of the collision and indirect effects due to perturbation of the tunes
 - Both these effects will be different for pp-Au collisions since the beam-beam parameters will be different.

Intrinsic Resonance to 100 GeV



Resonances Crossed during 100GeV Ramp

Resonance Response Sensitivity to Orbit Imperfections



Even with Imperfections at 0.2 shouldn't
See any Polarization losses since all our Intrinsic Resonance < 0.2

Lifetime Issues

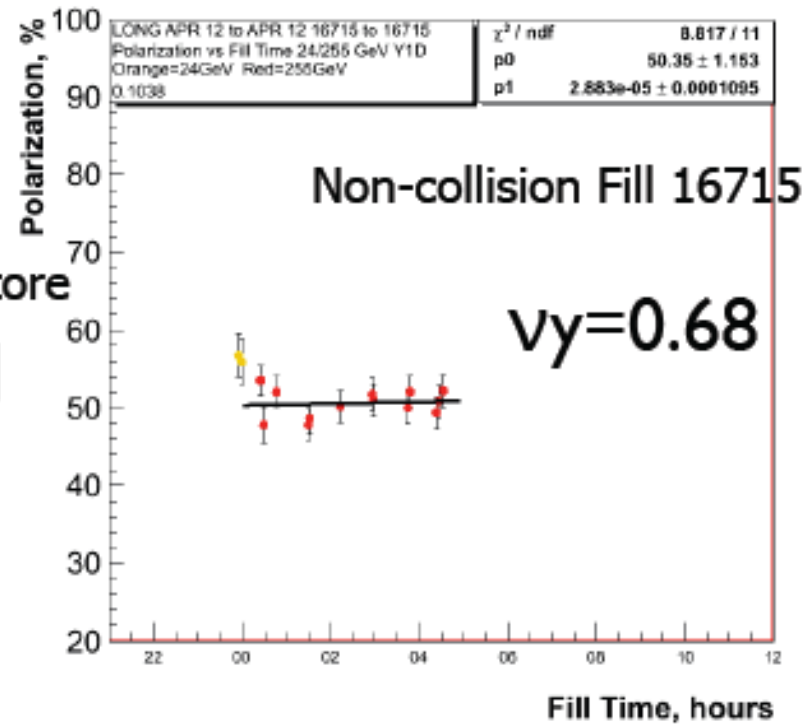
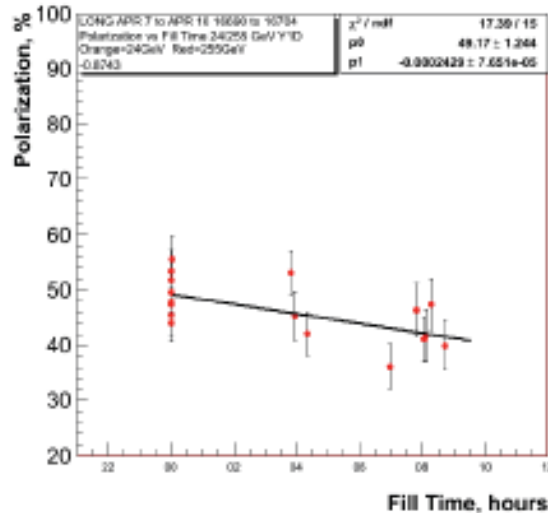
I can refer you to Zhe's and Mei's paper: "Beam-beam Effects On Proton Beam Polarization in RHIC "

- Lifetime appears to be driven by beam-beam effects
- They describe various mechanisms for this to work both direct and indirect.

Preliminary Analysis from Polarimeter Group

Yellow Ring

From a typical physics store



Plots are produced by Anders, Elke, etc.

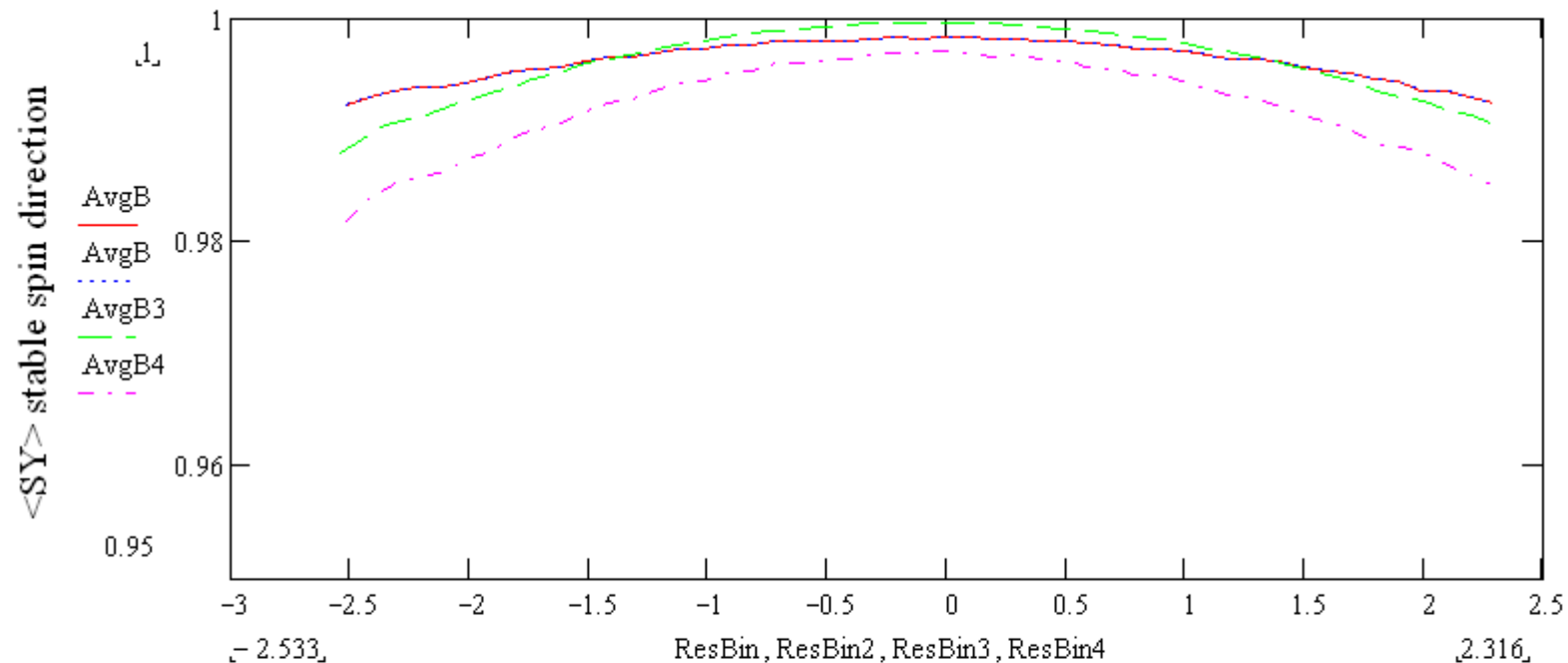
Difference in Lifetime for pp-Au versus pp-pp

- For our purposes it would seem that the relevant parameter would be the beam-beam factor which in the case of pp-Au should be nominally $<$ pp-pp
 - For the same emittance it's protons 2.5 times larger than Au.
 - Part of this gain might be offset due to the Au beam being brighter with Stochastic cooling.
 - Estimating the actual gain at this point is difficult since we are not yet confident about the actual physics of this process.

Potential Strategies for Lifetime:

- We anticipate by the time the pp-Au run is realized we will have developed some strategies:
 - Adjustment to the working point:
it is well known that snake resonances are all much weaker near the integer.
 - Suppression of nearest intrinsic and imperfection resonances
recently progress has been made in developing tools to optimize lattice considering the underlying intrinsic resonances

How Stable Spin Direction Varies with Ring Location



Sigma beam size for 20pi beam

- CNI Polarimeter
- ... IP8
- - P jet
- - IP6